भारतीय मानक
Indian Standard

IS 4410 (Part 15/Sec 2) : 2023

नदी घाटी परियोजनाओं से संबंधित शब्दावली

भाग 15 नहरगत संरचनाएँ

अनुभाग 2 परिवर्ती निर्माण कार्य

(पहला पुनरीक्षण)

Glossary of Terms Relating to River Valley Projects

Part 15 Canal Structures

Section 2 Transitions

(First Revision)

ICS 93.160

© BIS 2023

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

January 2023 **Price Group 4**

Canals and Cross Drainage Works Sectional Committee, WRD 13

FOREWORD

This Indian Standard (Part 15/Sec 2) was adopted by the Bureau of Indian Standards after the draft finalized by the Canals and Cross Drainage Works Sectional Committee had been approved by the Water Resources Division Council.

This standard includes technical terms with the precise definitions which are required to avoid ambiguity in their interpretation. To cover the various as per as of river valley projects, IS 4410 has been published in various parts.

This part (part 15) covers the important field of canal structures and in view of the vastness of this subject it is published in different sections. Other sections published under part 15 are:

a)	Section 1	General terms
b)	Section 3	Flumes
c)	Section 4	Regulating works
d)	Section 5	Cross drainage works

In the formulation of this standard due weightage has been given to international coordination among the standards and the practices prevailing in different countries in addition to relating it to the practices in the field in this country.

This first revision of the standard has been brought out to bring the standard in the latest style and format of the Indian Standards. In the revision of this standard, assistance has been derived in updating the definitions after the revision of ICID Multilingual technical dictionary on irrigation and drainage in 2009.

The composition of the Committee responsible for formulation of this standard is listed in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the results of a test or analysis, should be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS

Part 15 Canal Structures

Section 2 Transitions

(First Revision)

1 SCOPE

This standard (Part 15/Sec 2) covers the definitions of terms relating to transitions in canal structures.

2 TRANSITIONS

2.1 Angle of Flare, Angle of Splay — It is the inclination both in elevation and plan of the transition sides expressed as an angle or tangent of that angle.

2.1.1 The inclination in vertical is specified as ‘angle of vertical flare’ or ‘vertical flare’ or ‘angle of vertical splay’ or ‘vertical splay’ and that in horizontal as ‘angle of horizontal flare’ or ‘horizontal flare’ or ‘angle of horizontal splay’ or ‘horizontal splay’.

2.1.2 The angle between the center line of a structure and a wall.

2.2 Broken Back — It is the line of intersection of the vertical and sloping plane surfaces on the sides of the transition. It is also called as wedge transition.

2.3 Broken Back/Dog Leg Transition — A transition having a broken back.

2.4 Compound Transition — A combination of transitions, where more than one form is involved.

2.5 Conical Diffuser — A diverging cone of a pipe.

2.6 Control — A section or a reach of a conduit or open channel, where conditions exist that make the water level above it a fairly stable index of discharge. A control may be complete or partial. A complete control is independent of downstream conditions while partial control exists where downstream fluctuations have some effect on upstream water level.

2.7 Conversion Loss — The loss of energy due to change in velocity at the entrance and exit section of the transition, usually expressed in terms of head of water.

2.8 Elongated/Slender Transition — A transition whose length is more than the required standard design procedure or test research.

2.9 Fillet — The filling required in the transition section between a trapezoidal and a curved conduit.

2.10 Flaring — The place or part that spreads in the direction of flow; used as a noun, namely, flaring of wall.

2.11 Flow Spreading Hump — A hump built on the transition invert of expansion side within open transition to reduce scour (*see* Fig. 1).

2.12 Gate Transitions — Closed conduit transitions provided on both sides of the gate recess of chamber. Similar are valve transitions.

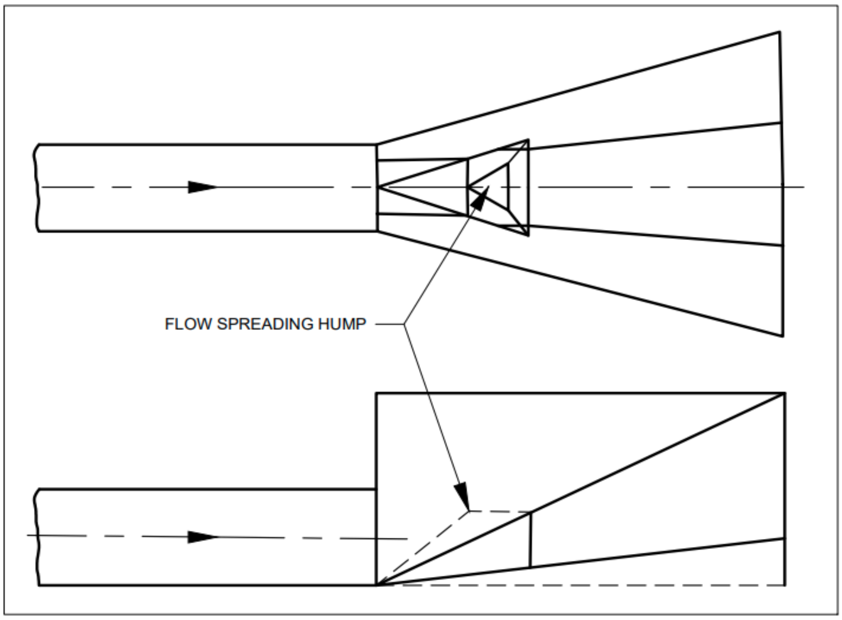

FIG. 1 FLOW SPREADING HUMP

2.13 Hydraulic Elements — The depth, area, perimeter, mean depth, hydraulic radius, velocity energy and other quantities pertaining to a particular stage of flowing water.

2.14 Hydraulic Transition — A length of conduit or channel wherein the cross- sectional shape is gradually changed from that of the conduit or channel upstream to that of the conduit or channel downstream. The transitions are characterized by adjectives bearing on their length (e.g. short, long, sudden, gradual), geometrical shape of the side walls (for example splayed, straight, warped, flared, streamlined), by reference to the adjacent structure (e.g. tunnel, valve, gate, inlet, outlet, tail) or by reference to type of flow in transition length (e.g. sub critical, supercritical, one dimensional or two dimensional supercritical flow). Also sometimes referred to as ‘conversion’.

2.15 Perfect Transition — A transition conforming in its shape and size with that evolved by standard procedures of design or test research, and in which rate of acceleration or deceleration so changes that the water surface profile becomes a smooth, continuous curve.

2.16 Portal Transition/Well Designed Transition — The transition section restricted within the portal length of a tunnel. In case of inlet portal, a bell- mouth can also be provided at its inlet face. Such a portal is called ‘bell-mouthed portal’. It is also called proper transition or regular transition.

2.17 Reverse Warped/S-warped Transition — A warped transition in which alignment of the side walls is of 'S' shape, and may not necessarily be streamlined.

2.18 Sharp/Short Transition — A transition whose length is less than required by the standard design procedure or test research.

2.19 Side Transitions — The portions of the sides of transition, in a closed conduit or open channel.

2.20 Sudden Transition — A transition where the change in cross section occurs in a relatively short distance inducing rapidly varied flow, viz. sudden contraction and expansion vertically, horizontally, or both.

2.21 Tail Inlet Transition — The transition provided upstream of a tail structure or at the tail end of, and contained within, the conduit length.

2.22 Tail Outlet Transition — The transitions provided partly or wholly downstream of a tail structure or tail end of a conduit.

2.23 Tail Transition — A transition or system of transitions provided at the tail end of a conduit or at a tail structure.

2.24 Transition Curve — Profile of the transition, which may be parabolic, elliptical, circular or compound.

2.25 Transition Curve Length — The length measured along the transition curve at any elevation. Also referred to as transition face length or transition surface length.

2.26 Transition Element — A small length along a transition curve.

2.27 Transition Energy Loss — The sum of the friction loss and the conversion loss in a transition, usually expressed in terms of head of water. Also referred as transition loss.

2.28 Transition Length — The length of the transition measured in the direction of the flow as given below:

a) Longitudinal axis in case of closed conduits, and
b) Centre line of the bed in case of open channels.

2.29 Warp — A gradual and uniform flaring out between the two different side slopes.

2.30 Warped Transition — A transition in which side walls are warped.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITON

CANAL AND CROSS DRAINAGE WORKS, WRD 13

Organisation	*Representative(s)*
Central Water Commission, New Delhi	Shri S. K. Sibal, Chief Engineer Design (N&W) **(*Chairperson*)**
Brahmaputra Board, Guwahati	Shri Gaya Prasad Singh Shri Shyamal Kr. Deka (*Alternate*)
Bhakra Beas Management Board, Punjab	Director Designs Senior Design Engr-1 (*Alternate*)
Central Board of Irrigation & Power, New Delhi	Dr. G.P. Patel Shri Sunil Sharma (*Alternate*)
Central Soil and Materials Research Station, New Delhi	Shri N. V. Mahure Shri Shahid Noor (*Alternate*)
Central Water & Power Research Station, Pune	Dr Neena Isaac Shri Suresh Kumar (*Alternate* I) Shri Arun Kumar (*Alternate* II)
Central Water Commission, New Delhi	Shri Manoj Kumar Meena Director (*Alternate*)
Indian Institute of Technology, Roorkee	Prof Manoj Kumar Jain Prof S. K. Singal (*Alternate*)
Indian Institute of Technology, Delhi	Dr B. R. Chahar
Irrigation & Water Resources Department, Govt. of Haryana	Shri Sandeep Taneja Shri Pardeep Yadav (*Alternate*)
Water Resources Department, Govt. of Bihar	Superintending Engineer
Water Resources Department Govt. of Rajasthan	Chief Engineer (ID&R) Director (CanalsID&R) (*Alternate*)
Water Resources Department, Govt. of Maharashtra	Shri Rajendra Pawar Shri M. M. Parate (*Alternate*)
Department Of Water Resources, Govt. of Punjab, India	Shri H. S. Mendiratta Executive Engineer Rc Cdo (*Alternate*)
Irrigation & Water Resources Department, Govt. of Uttar Pradesh	Shri Rakesh Kumar Gupta Shri Upendra Nath Kunwar (Alternate)
Water Resources Department, Govt. of Andhra Pradesh	Shri A. Suri Babu Suptdg Engineer(Canal) (*Alternate*)
Irrigation Department Govt. of Kerala	Shri Alex Varghese Shri Manju Balakrishan (*Alternate*)
Irrigation Research Institute, Roorkee	Shri Dinesh Chandra Shri Naveen Singhal (*Alternate*)
Narmada And Water Resources, Water Supply And Kalpasar Dept, Govt. of Gujarat	Shri A.M. Barve Shri B. H. Chauhdhary (*Alternate* I) Shri P. V. Vyas (*Alternate* II)
National Hydroelectric Power Corporation Limited, Faridabad	Shri Shrish Dubey Shri Prashant Jaiswal (*Alternate* I) Shri Deepak Verma (*Alternate* II)

Organisation	*Representative(s)*
Water Resources Organisation Public, Works Department (Pwd), Govt. of Tamil Nadu	Suptdg Eng Design Wrd Supt Engineer Canals (*Alternate*)
Sardar Sarovar Narmada Nigam Ltd., Gujarat	Director(Canals) Chief Engineer (Design) (*Alternate*)
Wapcos Limited, Gurgaon	Shri Shambhu Azad Shri A. K Gehlot (*Alternate*)
Water Resources Department, Raipur	Shri R. K. Nagaria Shri U. R. Rathor (*Alternate*)
Water Resources Department, Madhya Pradesh, Bhopal	Shri V. K. Washik Shri Bhagwati Prasad Gupta (*Alternate*)
In Personal Capacity, (*242, Siddhartha Enclave, New Delhi*) 110014	Prof S. K. Mazumder
In Personal Capacity, (*204, Raj Mahal Apartments, Devi Marg, Bani Park, Jaipur*) 302016	Shri Yogesh Chandra Agrawal
BIS Directorate General	Shri R. Bhanu Prakash, Scientist ‘E’/ Director and Head (Water Resources Department) [Representing Director General (*Ex-officio*)]

Member Secretary
Shri Dushyant Prajapati
Scientist ‘D’/Joint Director
(Water Resources Department), BIS

This Page has been Intentionally left blank

This Page has been Intentionally left blank

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Head (Publication & Sales), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.

This Indian Standard has been developed from Doc No.:WRD 13 (17987).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	2323 7617
Eastern	: 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091	2367 0012 2320 9474
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019	265 9930
Southern	: C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113	2254 1442 2254 1216
Western	: Plot No. E-9, Road No.-8, MIDC, Andheri (East), Mumbai 400093	2821 8093

Branches : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. CHANDIGARH. CHENNAI. COIMBATORE. DEHRADUN. DELHI. FARIDABAD. GHAZIABAD. GUWAHATI. HIMACHAL PRADESH. HUBLI. HYDERABAD. JAIPUR. JAMMU & KASHMIR. JAMSHEDPUR. KOCHI. KOLKATA. LUCKNOW. MADURAI. MUMBAI. NAGPUR. NOIDA. PANIPAT. PATNA. PUNE. RAIPUR. RAJKOT. SURAT. VISAKHAPATNAM.

Published by BIS, New Delhi